

Work Authorization Document

NSTX Upgrade Project

Control Account #:	7300	Title:	NB2 Management
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WBS	1.7.1.3	Title:	Project Support and Integration
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Period of Performance: 23 February 2009 through 30 September 2014

Authorized Budget:	\$1,450	Control Account Manager:	Stevenson
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Revision #:	0	Revision Date:	July-11
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Authorized Work Description:

Level of Effort job to cover the oversight of the 2nd Neutral Beam Upgrade work which includes a Manager, Engineering support and support and to cover Neutral Beam engineer's time to prepare for and participate in project cost and schedule reviews.

Attachments:

- 1- A detailed Control Account schedule showing all work packages and planning packages.
- 2- Budgeted Cost by month.
- 3- Original Work Authorization Form (WAF)
- 4- WBS Dictionary sheet that defines the scope of work for this WBS element.

Control Account History

ECP#	Implement Date	Prior Budget	New Budget	Signature

Approvals	Name	Signature	Date
NSTX-U Project Manager	R. Strykowski		
Control Account Manager	Stevenson		
Functional Manager	M. Williams		

Activity ID	Activity Description	Work Days	BASELINE START	Forecast Start	BASELINE FINISH	Forecast Finish	Schedule Slip (Days)	Total Float	Budgeted Cost	PPCT	Earned value cost (BCWP)	Planned value cost (BCWS)	FY11	FY12	FY13	FY14	FY15	FY16
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NSTX Upgrade Project

Subtotal		1,401	23FEB09A	23FEB09A	30SEP14	30SEP14	0	1,487	1,449,982.62		343,238.67	343,238.67						
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Job: 7300 - NB2 Management-STEVENSON

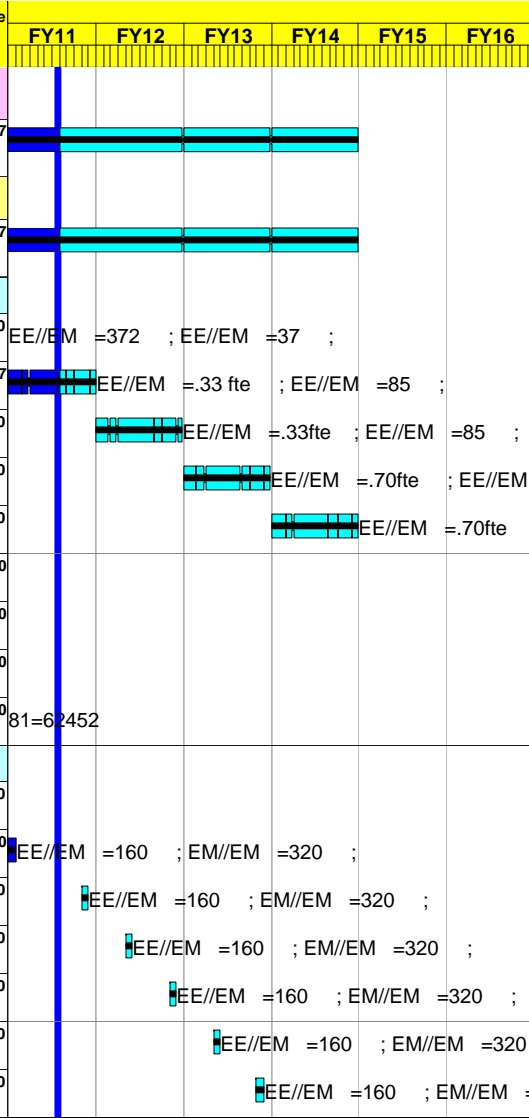
Subtotal		1,401	23FEB09A	23FEB09A	30SEP14	30SEP14	0	1,487	1,449,982.62		343,238.67	343,238.67						
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Project Management

7300-01	FY2010 NB2 Management	106*	03MAY10A	03MAY10A	30SEP10A	30SEP10A	0		0.00	100	0.00	0.00						
7300-11	FY2011 NB2 Management	250*	01OCT10*	01OCT10A	30SEP11	30SEP11	0	1,494	113,070.06	LOE	64,676.07	64,676.07						
7300-21	FY2012 NB2 Management	245	03OCT11*	03OCT11*	24SEP12	24SEP12	0	1,494	123,991.86		0.00	0.00						
7300-31	FY2013 NB2 Management	245	01OCT12*	01OCT12*	25SEP13	25SEP13	0	1,490	250,286.01		0.00	0.00						
7300-35	FY2014 NB2 Management	248	01OCT13*	01OCT13*	30SEP14	30SEP14	0	1,487	258,768.09		0.00	0.00						
FY092410	FY09 Actual Cost	22*	23FEB09A	23FEB09A	30SEP09A	30SEP09A	0		63,263.00	100	63,263.00	63,263.00						
FY102410	FY10 Actual Cost	40	01OCT09A	01OCT09A	25NOV09A	25NOV09A	0		12,157.00	100	12,157.00	12,157.00						
FY107300	FY10 Actual Cost	123	02NOV09A	02NOV09A	30APR10A	30APR10A	0		62,401.00	100	62,401.00	62,401.00						
FY107300A	FY10 Actual Cost	110	03MAY10A	03MAY10A	30SEP10A	30SEP10A	0		62,452.00	100	62,452.00	62,452.00						

Project Reviews

7300-02	FY2010 NB2 RLM's support of OPA reviews	92*	17MAY10A	17MAY10A	06JUL10A	06JUL10A	0		0.00	100	0.00	0.00						
7300-03	FY2010 NB2 RLM's support of EIR review	20	01OCT10*	01OCT10A	28OCT10	29OCT10A	-1		78,289.60	100	78,289.60	78,289.60						
7300-12	FY2011 NB2 RLM's support of OPA reviews	20	01AUG11*	01AUG11*	26AUG11	26AUG11	0	1,743	78,289.60		0.00	0.00						
7300-13	FY2011 NB2 RLM's support of OPA reviews	20	01FEB12*	01FEB12*	28FEB12	28FEB12	0	1,640	85,851.20		0.00	0.00						
7300-22	FY2012 NB2 RLM's support of OPA reviews	20	01AUG12*	01AUG12*	28AUG12	28AUG12	0	1,512	85,851.20		0.00	0.00						
7300-23	FY2012 NB2 RLM's support of OPA reviews	20	01FEB13*	01FEB13*	28FEB13	28FEB13	0	1,615	87,656.00		0.00	0.00						
7300-32	FY2013 NB2 RLM's support of OPA reviews	20	01AUG13*	01AUG13*	28AUG13	28AUG13	0	1,509	87,656.00		0.00	0.00						



Data Date: 30APR11 1105
 Run Date: 20MAY11 11:04

**NSTX UPGRADES
 RESOURCE LOADED SCHEDULE
 CD-2 Schedule
 April 2011**

Sheet 1 of 1

- Early Bar
- Progress Bar
- Critical Activity

7300 NB2 Management (Stevenson)	31JAN2011	28FEB2011	31MAR2011	30APR2011	31MAY2011	30JUN2011	31JUL2011	31AUG2011	30SEP2011	31OCT2011	30NOV2011	31DEC2011
BCWS	9	9	10	9	9	10	9	89	10	10	11	11
CUM BCWS	314	323	333	343	352	362	371	460	470	480	491	501
BCWP	9	9	10	9	0	0	0	0	0	0	0	0
CUM BCWP	314	323	333	343	343	343	343	343	343	343	343	343
ACWP	4	6	10	10	0	0	0	0	0	0	0	0
CUM ACWP	251	257	267	277	277	277	277	277	277	277	277	277
CV	63	66	66	65	65	65	65	65	65	65	65	65
SV	.	.	.	.	-9.	-19.	-29.	-117.	-127.	-137.	-148.	-159.
CPI	1.25	1.26	1.25	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24
SPI	1	1	1	1	0.97	0.95	0.92	0.74	0.73	0.71	0.7	0.68

7300 NB2 Management (Stevenson)	31JAN2012	29FEB2012	31MAR2012	30APR2012	31MAY2012	30JUN2012	31JUL2012	31AUG2012	30SEP2012	31OCT2012	30NOV2012	31DEC2012
BCWS	11	96	11	10	11	10	11	97	8	22	21	20
CUM BCWS	512	608	619	629	640	650	661	758	766	788	809	830
BCWP	0	0	0	0	0	0	0	0	0	0	0	0
CUM BCWP	343	343	343	343	343	343	343	343	343	343	343	343
ACWP	0	0	0	0	0	0	0	0	0	0	0	0
CUM ACWP	277	277	277	277	277	277	277	277	277	277	277	277
CV	65	65	65	65	65	65	65	65	65	65	65	65
SV	-169.	-265.	-276.	-286.	-297.	-307.	-318.	-415.	-423.	-445.	-467.	-487.
CPI	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24
SPI	0.67	0.56	0.55	0.54	0.54	0.53	0.52	0.45	0.45	0.43	0.42	0.41

7300 NB2 Management (Stevenson)	31JAN2013	28FEB2013	31MAR2013	30APR2013	31MAY2013	30JUN2013	31JUL2013	31AUG2013	30SEP2013	31OCT2013	30NOV2013	31DEC2013
BCWS	22	107	20	21	22	19	22	109	17	23	21	22
CUM BCWS	852	959	979	1,001	1,023	1,042	1,065	1,174	1,191	1,214	1,235	1,257
BCWP	0	0	0	0	0	0	0	0	0	0	0	0
CUM BCWP	343	343	343	343	343	343	343	343	343	343	343	343
ACWP	0	0	0	0	0	0	0	0	0	0	0	0
CUM ACWP	277	277	277	277	277	277	277	277	277	277	277	277
CV	65	65	65	65	65	65	65	65	65	65	65	65
SV	-509.	-616.	-637.	-658.	-680.	-700.	-722.	-831.	-848.	-871.	-892.	-914.
CPI	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24
SPI	0.4	0.36	0.35	0.34	0.34	0.33	0.32	0.29	0.29	0.28	0.28	0.27

Annex I – WBS Dictionary

This Work Breakdown Structure (WBS) organizes and defines the scope of the NSTX Upgrade using the WBS as established by the original NSTX project and modified to accommodate the NSTX Upgrade.

<u>WBS</u>			
<u>L1</u>	<u>L2</u>	<u>L3</u>	<u>Description</u>
1			NSTX UPGRADE PROJECT
	1.1		Torus Systems
		1.1.0	Project Integrated Model
		1.1.1	Plasma Facing Components
		1.1.2	Vacuum Vessel and Support Structure
		1.1.3	Magnet Systems
	1.2		Plasma Heating and Current Drive Systems
		1.2.1	High Harmonic Fast Wave (HHFW)
		1.2.2	Coaxial Helicity Injection (CHI) Current Drive
		1.2.3	Electron Cyclotron Heating (ECH)
		1.2.4	Neutral Beam Injection (NBI)
	1.3		Auxiliary Systems
		1.3.1	Vacuum Pumping System
		1.3.2	Coolant Systems
		1.3.3	Bakeout Heating System
		1.3.4	Gas Delivery System
		1.3.5	Glow Discharge Cleaning System
	1.4		Plasma Diagnostics
		1.4.1	Plasma Diagnostics
	1.5		Power Systems
		1.5.1	AC Power Systems
		1.5.2	AC/DC Converters
		1.5.3	DC Systems
		1.5.4	Control and Protection System
		1.5.5	General Power Systems and Integration
	1.6		Central Instrumentation and Controls (I&C)
		1.6.1	Control System
		1.6.2	Data Acquisition System
	1.7		Project Support & Integration
		1.7.1	Project Management and Integration
		1.7.2	Project Physics
		1.7.3	Integrated Systems Tests
	1.8		Site Preparation and Assembly
		1.8.1	Site Preparation
		1.8.2	Torus Assembly and Construction

Annex I – WBS Dictionary

real-time plasma control system may require an upgrade to accommodate additional input/output signals, control loops, and a longer control period. The networks, back-end compute servers, and data storage systems will need to be upgraded to achieve reasonable performance for time-sensitive functions. Some test cell racks will be relocated; there will be a modest effort required to route the control, timing, and communication cabling and qualify the systems.

{Central I&C and Data Acquisition (Job 6100)}

WBS Element: 1.7

WBS Level: 2

WBS Title: Project Support & Integration

Definition: Project support and integration includes the non-hardware related subsystems such as overall Project Management and Administration, Project Physics as well as Integrated Systems Testing support.

WBS Element: 1.7.1

WBS Level: 3

WBS Title: Project Management and Integration

Definition: The project management and integration WBS element consists of all the activities necessary to plan, monitor, integrate and control, and report on the progress of the NSTX Upgrade Project which includes technical, business, and administrative planning and support; organizing, directing, coordinating, controlling, reviewing and approving project actions.

WBS Element: 1.7.1.1

WBS Level: 4

WBS Title: Project Management & Integration

This WBS element includes overall management; a Project Manager, Deputy Project Manager, and Project Controls support to manage, monitor, integrate, control, and report on the progress on the NSTX Upgrade. Also included in this WBS element is System Engineering support and support for updating of the General Arrangement Drawings for the NSTX Test Cell as well as funds for independent reviewers as necessary.

{Project Management and Integration (Job 7100)}

WBS Element: 1.7.1.2

WBS Level: 4

WBS Title: Center Stack Upgrade Management

Definition: Level of Effort job to cover the oversight of Center Stack Upgrade work which includes a Manager, Project Engineering support and support and to cover Center Stack engineer's time to prepare for and participate in project cost and schedule reviews.

{NSTX CSU Project Management (Job 7200)}

WBS Element: 1.7.1.3

WBS Level: 4

WBS Title: Neutral Beam Upgrade Management

Definition: Level of Effort job to cover the oversight of the 2nd Neutral Beam Upgrade work which includes a Manager, Engineering support and support and to

Annex I – WBS Dictionary

cover Neutral Beam engineer's time to prepare for and participate in project cost and schedule reviews.

{NBI Project Support & Integration (Job 7300)}

WBS Element: 1.7.1.4

WBS Level: 4

WBS Title: Health Physics Support

Definition: This WBS element includes the effort necessary for continuous health physics (HP) support for the Neutral beamline decontamination, refurbishment, and relocation to the NTC as well as the HP support for equipment removal and relocations being accomplished under WBS 1.2.4.

{Health Physics Technical Support (Job 7400)}

Also included in this WBS element are the home office Health Physics efforts necessary to support the collection of radiological analyses of various environmental samples and bioassay samples, and the collection of analyses of data on the gamma radiation spectra of radioactive material at PPPL that are allocated to all Laboratory projects based on their usage of Health Physics staff.

{NSTX Upgrade Health Physics Allocations (Job 7700)}

WBS Element: 1.7.1.5

WBS Level: 4

WBS Title: Direct Allocations (Job 7710)

Definition: This WBS element includes the costs to cover Laboratory Engineering and Scientific Computing and Environmental Services that are allocated to all Laboratory projects based on their funding levels.

{NSTX Upgrade Direct Allocations (Job 7710)}

WBS Element: 1.7.2

WBS Level: 3

WBS Title: Project Physics

Definition: Project Physics includes the definition of requirements necessary to meet the overall NSTX mission and supporting objectives, physics analysis supporting the project's design and construction activities, and definition of R&D needs. In addition it includes the provision of hardware and software required for plasma control.

Project Physics is not included in the scope of the Upgrade Project.

WBS Element: 1.7.3

WBS Level: 3

WBS Title: Integrated Systems Tests

Definition: This element includes all of the activities associated with the support of development of all necessary procedures and documents to support the integrated tests, and to support performance of the pre-operational integrated system tests culminating in first plasma.

The WBS element includes Convening the NSTX Activity Certification Committee (ACC) for comprehensive review the upgrades. Prepare and make presentation to the PPPL ES&H Executive Safety Board for

Work Approval Form (WAF)

Cost Center: 9418
Job Number: 7300
Job Title: NBI Project Support & Integration
Job Manager: Tim Stevenson


Description:

Management and engineering oversight of NBI upgrade through FY2013. Job engineer preparation for reviews every 6 months. (6 engr*80hours*2 reviews/yr.).

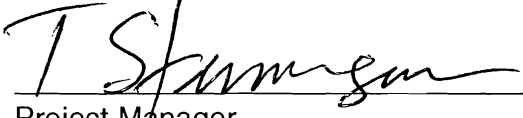
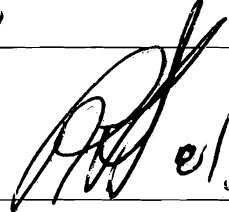
Schedule:

Refer to Primavera Data-Base

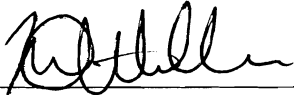
Approvals:

 7/20/10

Job Manager

 7/20/10  8/3/10

Project Manager

 8/3/10

Engineering Department Head

Cost Center: 9418
 Job Number: 7300
 NBI Project Support & Integration
 Job Manager: Tim Stevenson

Estimate (user input)

USER INPUT TASKS AND DESCRIPTIONS

SCHEDULE

USER INPUT

task	ref	cross	numb	optional	Task Description	Resp	Duration in WORK DAYS	Logical Pre-requisites (one task numbers in each column, any order)	User Input Start Date (optional)	contingency	Names of req'd skills if known	Basis of Estimate Category	
1					Engineering Mgmt of NBI Upgrade FY10		260		10/1/09				
2					Job Engineer (6 engr) prep for reviews 2/yr.		10		5/1/10	13%		50% time of Proj Manager 80hrs/ each of 6 engineers 2 times each year to support reviews	
3					Fall review		10		9/15/10	13%			
4					Engineering Mgmt of NBI Upgrade FY11		260		10/1/10				
5					Job Engineer (6 engr) prep for reviews 2/yr.		10		5/1/11	13%		50% time of Proj Manager 80hrs/ each of 6 engineers 2 times each year to support reviews	
6					Fall review		10		9/15/11	13%			
7					Engineering Mgmt of NBI Upgrade FY12		260		10/1/11				
8					Job Engineer (6 engr) prep for reviews 2/yr.		10		5/1/12	13%		70% time of Proj Manager 80hrs/ each of 6 engineers 2 times each year to support reviews	
9					Fall review		10		9/15/12	13%			
10					Engineering Mgmt of NBI Upgrade FY13		260		10/1/12				
11					Job Engineer (6 engr) prep for reviews 2/yr.		10		5/1/13	13%		70% time of Proj Manager 80hrs/ each of 6 engineers 2 times each year to support reviews	
12					Fall review		10		9/15/13	13%			
13													
14					7300 include 0.1 FTE in mgmt for FY 10-13 for Al von Halle as RLM								
15													
16													

TOTALS										690		
TOTAL Preliminary Cost Estimate (\$K)=										\$1,468		

Notes:
 (1) Procurement lead time:
 Purchase orders-Commercial, off-the-shelf items 3 Weeks
 Purchase orders-Noncommercial items 5
 Subcontracts (non construction) 8
 Construction subcontracts 9

CATEGORIZATION CODES:												
1 - National Standards												
2 - Engineering Judgement/Experience												
3 - Estimates/Data from External Sources (e.g., W7X, ATF, etc.)												
4 - Previous PPP/ORN Experience (e.g., TFTR, NSTX, PLT, etc.)												
5 - Prototype Data/Test Results												
6 - Catalogue Price/Vendor Quote												
7 - Placed Contracts												
8 - Actual experience for NCSX Work												
9 - Other												

Cost Center:		9418												
Job Number:		7300												
##	9418 NBI Project Support & Integration													
Job Manager:		Tim Stevenson												
Uncertainty of the Estimate		High	Medium	Low	Uncertainty Range (%)									
	Design Maturity		X											CDR level plan
	Design Complexity		X											CDR level plan
<u>Residual Impacts</u>		Risk Description			Likelihood of Occurring	Mitigation Plan	Basis of estimate	Cost Impact		Schedule Impact				
								Low (\$K)	High (\$K)	Low (weeks)	High (Weeks)			
1		Increased management oversight due to unscoped additional reviews								75				
2														
3														
4														
5														
<u>Notes:</u>														
(1) Cost impacts should NOT include standing army costs which are separately calculated from the schedule impact														
(2) The schedule impacts should be entered as the min and max impacts on the critical path. If there is no critical path impact then the schedule entries should be zero.														
(3) Likelihood of occurrence should be entered consistent with our risk classification methodology, i.e. VL= Very Likely (P>80%), L=Likely (80%>P>40%), U=Unlikely (40%>P>10%), VU=Very Unlikely (P<10%), NC=Non-credible (P<1%)														
<u>Comments/Other Considerations</u>														

Design Complexity		Design Maturity Definition	
		High	Medium
Design Maturity	High	Final design available. All design features/requirements well known. No further design development or evolution expected that will impact estimate.	
	Medium	Preliminary design available. Some additional design evolution likely. Further developments can be somewhat expected or anticipated and reflected in estimate.	
	Low	No better than conceptual design basis currently available. Design details, procedures, etc. still need much development and evolution of requirements beyond estimate basis is likely and expected.	
Design Complexity Definition		High	
		Medium	
Design Complexity	High	Work is fairly well understood -- either standard construction or repetition of activities performed in past. Little likelihood of estimate not being well understood and requirements not being well defined.	
	Medium	More complex work requirements that have potential to impact cost and schedule estimates. Limited experience performing similar tasks, so ability to estimate accurately is somewhat suspect	
	Low	Extremely challenging tasks and/or requirements. Unique or first-of-a-kind assembly or work tasks. No good basis for estimating work exists so there is a high degree of estimate uncertainty. Based on standard industry and DOE estimate classifications (Per AACEI Recommendation)	

Cost Center: 9418
 Job Number: 7000
 9418 1418
 Job Manager: Tim Stevenson

Materials and Subcontracts (M&S)
 Description:

NOT APPLICABLE

Basis of Estimate
 FTYDR

HOURS (based at FTYDR)

CATEGORIZATION CODES:	
1 - National Standards	
2 - Engineering Judgment/Experience (e.g. NFE, JTF, etc.)	
3 - Previous PPL/OWH Experience (e.g. TTR, NSTA, P.T., etc.)	
4 - Previous PPL/OWH Experience (e.g. TTR, NSTA, P.T., etc.)	
5 - Prototype Data/Test Results	
6 - Manufacturer's Data/Supplier Quotes	
7 - Planned Contracts	
8 - Actual experience for RCSI Work	
9 - Other	

TOTALS